

## Claim Amendments

Cancel claims 1-3 and 6-20 without prejudice.

Add claims 21-42.

### Listing of all claims per revised 37 CFR §1.121

1. (cancelled) A sensor for measuring heat flux in a solid body comprising:  
a thin substrate of thermally conducting, electrically insulating material;  
a thin film thermopile deposited on a surface of said substrate with hot junctions near one end of said substrate and cold junctions near the other end of said substrate;  
a thin, flat plate of thermally conducting, electrically insulating material for covering the thermopile on said substrate;  
electrical connections on said thin film thermopile for measuring its voltage; and  
means for imbedding said substrate and said plate within said solid body.
2. (cancelled) The sensor of claim 1 in which said means for imbedding said substrate and said plate within said body comprise:  
a threaded, slotted plug for holding said substrate and said flat plate together; and  
a threaded hole in said solid body.
3. (cancelled) The sensor of claim 1 in which said means for imbedding said substrate and said plate within said body comprise:  
a cylindrical plug for holding said substrate and said flat plate together; and  
a hole in said solid body with diameter suitable for a press fit of said plug into said hole in said solid body.
4. (cancelled) The sensor of claim 1 in which said slot is formed in the side of said plug.
5. (cancelled) The sensor of claim 1 in which said slot is formed in the end of said plug.
6. (cancelled) The sensor of claim 1 in which said means for imbedding said substrate comprises a hole in said solid ~~object~~ body sized for pressing the combination of said substrate and said flat plate directly into said solid ~~object~~ body.
7. (cancelled) The sensor of claim 1 in which the materials of said substrate and said flat plate have thermal properties closely matching those of said solid ~~object~~ body.
8. (cancelled) The sensor of claim 2 in which the materials of said substrate and said flat plate and said plug have thermal properties closely matching those of said solid ~~object~~ body.
9. (cancelled) A method for measuring heat flux in a solid body consisting of:

depositing a thin film thermopile on a thin substrate of thermally conducting, electrically insulating material with hot junctions near one end of said substrate and cold junctions near the other end of said substrate;  
covering said thin film thermopile on said substrate with a thin, flat plate of thermally conducting, electrically insulating material;  
imbedding said substrate and said plate within said solid body; and  
making electrical connections to said thermopile for measuring its potential.

10. (cancelled) The method of claim 9 in which the materials of said substrate and said flat plate have thermal properties closely matching those of said object body.

11. (cancelled) The method of claim 10 in which said substrate and said plate are imbedded by first enclosing them in a threaded plug whose thermal properties closely match those of said solid object body and inserting said plug in a threaded hole in said solid body.

12. (cancelled) The sensor of Claim 2 in which said plug is slotted on the side.

13. (cancelled) The sensor of Claim 2 in which said plug is slotted on the end.

14. (cancelled) A sensor for measuring temperature differences between a first and a second point within a solid body comprising:  
a first and a second thin film thermocouple,  
means for imbedding said first thin film thermocouple in said solid body at said first point,  
means for imbedding said second thin film thermocouple in said solid body at said second point, and  
means for measuring the difference in output potentials of said thin film thermocouples.

15. (cancelled) The sensor of claim 14 in which said means for imbedding said thermocouples consists of a plug closely fitting into a hole in said solid body and said thermocouples are deposited on said plug.

16. (cancelled) The sensor of claim 14 in which said means for imbedding said thermocouples consists of a thin substrate, and said thermocouples are deposited on said substrate.

17. (cancelled) The sensor of claim 16 further comprising a thin cover for said substrate.

18. (cancelled) The sensor of claim 15 in which the thermal properties of said plug match those of said solid body.

19. (cancelled) The sensor of claim 16 in which the thermal properties of said substrate match those of said solid body.

20. (cancelled) The sensor of claim 17 in which the thermal properties of said substrate and said

cover match those of said solid body.

21. (new) A sensor for measuring a vector component of heat flux comprising:  
a thin flat substrate plate of thermally conducting, electrically insulating material;  
a thin film thermopile deposited on a surface of said substrate plate with the axis of said thermopile aligned with said vector; and  
electrical connections on said thin film thermopile for measuring its voltage.
22. (new) The sensor of Claim 21 further comprising a thin flat cover plate of thermally conducting, electrically insulating material covering said thermopile on said substrate plate.
23. (new) The sensor of claim 22 further comprising a solid body; and  
means for holding together and imbedding said substrate plate and said cover plate within said solid body.
24. (new) The sensor of claim 23 in which said means for holding together and imbedding said substrate plate and said cover plate within said solid body comprises a threaded plug having a slot for holding said substrate plate and said cover plate together.
25. (new) The sensor of claim 23 in which said means for holding together and imbedding said substrate plate and said cover plate within said solid body comprises a cylindrical plug having a slot for holding said substrate plate and said cover plate together.
26. (new) The sensor of claim 24 in which said slot is formed in the side of said plug.
27. (new) The sensor of claim 25 in which said slot is formed in the side of said plug.
28. (new) The sensor of claim 24 in which said slot is formed in the end of said plug.
29. (new) The sensor of claim 25 in which said slot is formed in the end of said plug.
30. (new) The sensor of claim 23 in which the materials of said substrate plate and said cover plate have thermal properties closely matching those of said solid body.
31. (new) The sensor of claim 23 in which the material of said substrate plate and said cover plate is aluminum nitride.
32. (new) The sensor of claim 23 in which said substrate plate and said cover plate are made of metal having a thin coating of electrical insulating material over at least a part of their surfaces.
33. (new) A sensor for measuring heat flux along an axis within a solid body comprising:  
a thin flat substrate plate of thermally conducting, electrically insulating material;

a thin film thermopile deposited on a surface of said substrate plate with hot and cold junction pairs of said thermopile aligned with said axis;  
electrical connections on said thin film thermopile for measuring its voltage; and  
means for imbedding said substrate plate within said solid body.

34. (new) The sensor of claim 33 further comprising a cover plate of thermally conducting, electrically insulating material for covering said thermopile on said substrate plate.

35. (new) The sensor of claim 34 in which said means for imbedding said substrate plate within said body comprise:  
a threaded plug having a slot for holding said substrate plate; and  
a threaded hole in said solid body.

36. (new) The sensor of claim 34 in which said means for imbedding said substrate plate within said body comprise:  
a cylindrical plug having a slot for holding said substrate plate; and  
a hole in said solid body with diameter suitable for a press fit of said plug into said hole in said solid body.

37. (new) The sensor of claim 35 in which said slot is formed in the end of said plug.

38. (new) The sensor of claim 36 in which said slot is formed in the end of said plug.

39. (new) The sensor of claim 35 in which said slot is formed in the side of said plug.

40. (new) The sensor of claim 36 in which said slot is formed in the side of said plug.

41. (new) The sensor of claim 33 in which the material of said substrate plate has thermal properties closely matching those of said solid body.

42. (new) The sensor of claim 34 in which the materials of said substrate plate and said cover plate have thermal properties closely matching those of said solid body.

### Discussion

Examiner objected to Claims 1-3, 6-8, 12 and 13, suggesting that the claim language should more clearly describe the invention. Applicants have duly considered examiner's objection and have found no simple way of modifying the language of the claims to meet this objection. Instead, applicants have written, and now submit for examination, new claims 21-42 above.

The language in the specification relied upon as a basis for the new claims is in (renumbered) Page 4, lines 18-20, "When heat flows through the solid object the output voltage of the thermopile indicates the magnitude of the heat flux vector along the thermopile axis." Also

relied upon is the language of (renumbered) Page 9, lines 25-28, "If the sensor of the preferred embodiment is installed in a solid material with its axis aligned with the flow of heat, it will indicate the total conductive heat flux in the solid.. However, if the axis of the sensor is not aligned with the flow of heat, it will indicate the vector component of heat flux parallel to its axis." These paragraphs, together with the drawings, are believed to clearly describe the invention and define the terms used in the new claims.

Applicants propose new independent Claims 21 and 33 to more distinctly and particularly claim the invention described in the specification. Dependent claims 22-32 and 34-42 are proposed to further define and delimit the property claimed. by applicants.

Examiner objected to the use of the term "object" in Claim 11, and it has been eliminated in the new claims.

Examiner rejected Claims 15 and 18 under 35 USC §112 as failing to comply with the written description requirement. These claims have been cancelled.

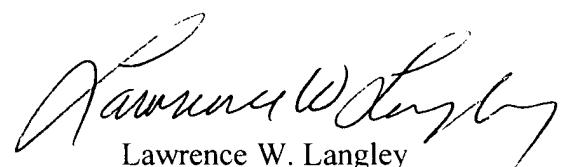
Examiner rejected Claims 14-20 under 35 USC §112 as failing to comply with the written description requirement. These claims have been cancelled.

Examiner rejected Claims 9, 10 and 11 under 35 USC §112 as being incomplete for omitting essential steps.. These claims have been cancelled.

Examiner has rejected Claims 14, 16, 17, 19 and 20 under 35 USC §102(b) as being anticipated by Hedengren (U. S. Pat. No. 6,084,174). These claims have been cancelled.

Applicants' new claims 21 and 22 clearly go beyond the rewriting or amendment of Claim 1 as proposed by examiner in the Office action of August 6, 2003. Neither the references cited by examiner or any other reference found by applicants mentions the concept of a heat flux vector measurement. Therefore applicants are emboldened to add these new claims, which do not have the limitation of the sensor being imbedded in a solid body.

The remainder of the new claims have been drafted to overcome the objections in the Office action of August 6, 2003 to Claim 1 and its dependent claims 2-3, 6-8, 12 and 13. Having responded to each of examiner's objections and rejections, and having provided new claims which more distinctly point out and claim the invention, applicants believe the application is in condition for allowance, and respectfully request that it be passed to issue.



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